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NEW USSR ENGINEERING TECHNIQUE AND TEMPO OF CONSTRUCTION

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New techniques and improvements throughout all branches of the national economy are speeding up production and shortening the time required to obtain the finished product. Processes which 20 years ago required days to complete are now accomplished in a matter of hours.

High-speed cutting, high-speed electric welding, and the use of high-frequency currents in tempering have all been introducted into the field of metal processing. Metallurgy now employs high-speed smelting as well as high-speed rolling of metals. The application of newer and newer catalysts has resulted in sharp acceleration of chemical processes. The drying process in woodworking has been reduced from 10 days to 4 hours through utilization of high-frequency currents.

An interesting experiment was conducted in the laboratory of one textile enterprise to determine the amount of time necessary to turn raw materials into the finished product. At noon, a sheep was brought into the laboratory and shorn. In a matter of minutes the wool was sent to be washed and then was put through all the various processes and machines used in the making of textiles. At 1600 hours, the manufactured cloth was turned over to the tailor shop where, an hour later, it was made into a suit.

Our construction is as far advanced technologically as other branches of our industry. The application of such technology radically accelerates all processes, beginning with research and ending with the finishing phases.

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Extensive geodetic surveys and road surveying, which formerly required several years of work, are now accomplished in the course of 2 or 3 months by means of aerial photography, with more complete and accurate results obtained.

Prolonged and painstaking geologic research is greatly accelerated through electrical means of surveying subsurface waters, by the application of vibrosounding devices for conducting subsoil tests, and by burning passages through rock formations by means of an autogenous bore.

The period of preparatory work in the development of new construction is being shortened greatly through the application of prefabricated, dismountable structures for housing, warehouses, and auxiliary enterprises.

New types of construction machines and equipment are fundamentally changing and greatly accelerating all construction processes.

Construction work at building sites is being reduced to the simplest and least time-consuming operation of installing prefabricated structures and parts in the form of reinforced-concrete floor slabs, stairways, and ready-made doors, windows, and frames. Dry plaster and quick-drying paints and laquers in their turn are sharply reducing the time consumed in the final phases of construction.

With such means at one's disposal it would be possible to achieve the shortest of production schedules, not only in the case of individual projects, but for all types of construction. Incommensurably prolonged periods, however, continue to prevail in construction operations.

Some startling information with respect to this problem was brought forth at the All-Union Conference of Builders which was held in the Kremlin.

There exists a rather widespread opinion that reduction of construction time is of no considerable economic significance, that it "yields but little results." The reason, as expressed, is that the cost of concrete or brick, for example, will not change, regardless of whether a project will be in construction for 2 or 4 months. It is said that, even were labor costs to undergo change, they could only increase, because reducing construction time would require more labor and technical personnel, involving in greater housing and municipal expenditures. It is calculated that the costs of mechanization will also increase. And even were a certain economy in overhead to be achieved through decreasing construction time, this would hardly compensate for the remaining excessive expenditures.

Is not such an "interpretation" of economics responsible for the existing situation when planning, financing, and actual construction operations are slow in spite of tremendous technological changes and other favorable factors already in existence?

The time has come to get rid of such crude mistakes. The considerations and calculations described above have some basis, perhaps, when the question of shortening construction-periods at some single building-site arises. But they are altogether inadmissible if considered with respect to the interests of the state and the national economy as a whole.

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As an example, we shall allow that it is necessary, during an 8-year period, to build 8 new cement plants, each with a production capacity of 600,000 tons per year, at a cost of 200 million rubles each. We see two possible ways of planning and financing these projects.

In the first case, we calculate that the construction of each new enterprise will take 8 years on the average. To put all of these plants into operation within the allotted period, it is necessary to construct them simultaneously, with a dispersed front, and finance them according to the scheme represented in Table 1.

Table 1. Expenditures in Millions of Rubles

Plant No	Years in Construction							
	1	2	3	4	5	6	7	8
1	10	25	25	25	25	25	35	30
2	10	25	25	25	25	25	35	30
3	10	25	25	25	25	25	35	30
4	10	25	25	25	25	25	35	30
5	10	25	25	25	25	25	35	30
6	10	25	25	25	25	25	35	30
7	10	25	25	25	25	25	35	30
8	10	25	25	25	25	25	35	30
Total	80	200	200	200	200	200	280	240

In the second case, we have only a 2-year period for the construction of each plant. In this case, as is obvious from Table 2, it is necessary to construct only two plants simultaneously, but the organization of all construction must be continual, and the financing concentrated. The constructed plants are put into operation immediately upon completion.

Table 2. Expenditures in Millions of Rubles

Plant No	Years in Construction							
	1	2	3	4	5	6	7	8
1	80	120 Plant in operation						
2	--	80	120 Plant in operation					
3	--	--	80	120 Plant in operation				
4	--	--	--	80	120 Plant in operation			
5	--	--	--	--	80	120 Plant in operation		
6	--	--	--	--	--	80	120 Plant in operation	
7	--	--	--	--	--		80	120 Plant in operation
8	--	--	--	--	--		80	120 Plant in operation
Total	80	200	200	200	200	200	280	240

In comparing the two tables, we are aware of at least eight advantages and benefits to be gained from reduction of the construction period and continual organization of construction. They are as follows:

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1. During the long periods of incomplete construction (Table 1), a large amount of capital will become frozen. This amount will increase from year to year, and after 7 years will come to 1.36 billion rubles. In the second instance (Table 2), the amount at the end of each year (except the seventh) will come to only 80 million rubles.

2. Construction, whether undertaken according to the first or the second method, would be fully completed during the 8-year period. But according to the second method, during that same period of time, the national economy would receive 21 annual volumes of production, or 12.6 million tons of cement. On the other hand, by the first method there would be no production whatever from the new plants during those 8 years, and this must be considered as an actual loss of hundreds of millions of rubles to the national economy.

3. Production of the large new enterprises usually is not as expensive as the production of old ones. A ton of cement from the new Belgorod plant is 20 rubles cheaper than the average cost of a ton of this product from the industry as a whole. This means that it is profitable for the national economy to complete the new plants as soon as possible, because inexpensive production makes for greater profit and permits reduction of prices. The new plants, if constructed according to the second method, would permit an economy of about 250 million rubles in the cost of cement production during the 8 years.

4. The second plant built consecutively is as a rule constructed cheaper than the first, and the costs of the third and fourth drop still more. This is due to an accumulation of experience by the builders, specialization, know how, and an increase in the productivity of labor. All these advantages for reduction of construction costs accrue in the second instance, with continual construction, but are absent in the first, when all building projects are being carried out simultaneously.

5. By studying the performance of the plants already put into operation, the planning organizations can expose defects in the plans and introduce corrections for the future. Take, for example, the difference in expenditure of materials at various typical cement-plant projects of equal capacity which occurred during the postwar period.

Table 3.

Plans Prepared in	Expenditures	
	Metal (tons)	Reinforced Concrete (cu m)
1947	7,023	26,400
1950	4,211	22,765
1952	3,320	19,000

With the simultaneous construction of all plants (first scheme), the possibility of introducing improvements into the project is extremely limited. But in the second instance, improvements are natural and would be introduced without fail. One must also keep in mind that, under the first construction scheme, all plants, when put into operation, would be based on 8-year-old technological methods. But the second method of construction would provide the opportunity to introduce the latest achievements, and the project for each plant would be only 2 years old.

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6. Continual organization and short periods of construction require designing of only one plant at a time and not eight plants, which is unavoidable if the first method is applied. This permits concentration of all attention and the better forces of specialists on a single project, and also permits the timely supply of high-quality technical plans to the builders.

7. The simultaneous construction of only two plants instead of eight has a favorable effect on the ministries' activities in directing the construction. All problems of operational planning and supply of materials, equipment, and qualified cadres are much more easily and effectively solved when only two plants are built simultaneously instead of eight. The occasion no longer arises for dispatching equipment "to the wrong address" and for the muddled confusion of supply. The number of administrations, the extent of administrative apparatus, the volume of accounts, and the overhead are proportionately less.

8. The available new, powerful machinery for construction cannot be fully utilized on a small scale or on small volumes of operation, just as an airplane cannot be used to fly at a speed of 20 kilometers per hour. During long periods of construction, the large volume of the construction work becomes artificially disintegrated into a great number of small projects being erected simultaneously. On such building sites technical equipment stands idle most of the time, and no prefabricated structures are utilized.

If the construction periods are short, the means of construction are concentrated on a limited number of projects, and there is a great volume and broad scale of operations. Under this system machines operate at their full rated capacities, prefabricated structures become necessary, and the productivity of labor sharply increases.

It follows that, in order to erect industrial enterprises in the shortest possible periods, it is necessary to utilize all new construction techniques, to concentrate all potentialities on a minimal number of projects, and to organize a continuous process of construction.

Time required for construction has so great an economic significance that it is not permissible to set construction time for new mines, plants, factories, roads, and similar large projects without first checking the calculation of time factors.

The formulation of technological rules is a simple and reliable method for calculating the time required for construction. Standard plans for complex mechanization and standard technological charts for the construction work are available to help in the calculations.

The following data may be cited by way of providing information concerning the periods of construction which are characteristic of the contemporary level of our technology: construction of the Kuybyshev Hydroelectric Power Station, the Moscow State University, and similar projects requires 3-4 years. Metallurgical plants with double-unit blast furnaces, and full-cycle production of rolled steel, can be built in 2-2 1/2 years; thermal electric power stations of 200-300 thousand kilowatts in capacity require about 2 years; large cement plants require 1 1/2-2 years. Multistoried residential buildings can be built (and many already are being built) according to the rule, "A month of construction per story of building."

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When planning for construction it is necessary to overcome the strong temptation to build many projects simultaneously, extending their construction over long periods. Furthermore, the customary opinion that the preparation period takes one or 2 years should be considered as obsolete.

It is necessary to overcome underestimation of new construction techniques, and to adapt planning of capital construction work to their potentialities. The new technology will not fail; given a chance to be utilized to its full capacity, it will yield high results which at present seem unattainable. This in turn will create new potentialities for realization of the most far-reaching plans for the further development of our economy, and for a rapid rise in the cultural and material welfare of the people.

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